

# Space News Roundup

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National Aeronautics and Space Administration

## News Briefs

### ESA approves Hermes

Hermes, the reusable orbiter proposed by CNES, the national space agency of France, has been approved by the Council of the European Space Agency and will now become a formal ESA program. The decision was reached in late June. The next step will be for ESA member nations to express interest in the program and specify areas in which they would like to take a technical role. This Preparatory Programme, as it is being called, will run from the fall of 1986 to June 1987 and will include not only vehicle studies, but launch facility, ground support and EVA technology studies as well. According to ESA, this will make possible a decision in mid-1987 on whether to undertake a formal development phase. Under this timeline, ESA foresees the first flight of Hermes in 1995 or 1996 atop an uprated Ariane 5 expendable launcher. Hermes is a delta-winged orbiter capable of delivering around 10,000 pounds to low Earth orbit. It could carry a crew of up to six persons and would be able to dock with the Columbus module, the European contribution to the Space Station.

### SSME test fired

Testing of Space Shuttle Main Engines (SSME) has resumed at the National Space Technology Laboratories for the first time since the Challenger accident. SSME Number 2006, which flew on Columbia during the first five Shuttle missions, was fired for 90 seconds from high atop a test stand at NSTL June 26. The successful test was designed to check out the engine system and ground support equipment under cryogenic conditions. The developmental firings conducted at NSTL also allow engineers to lengthen mission life and study thrust level settings.

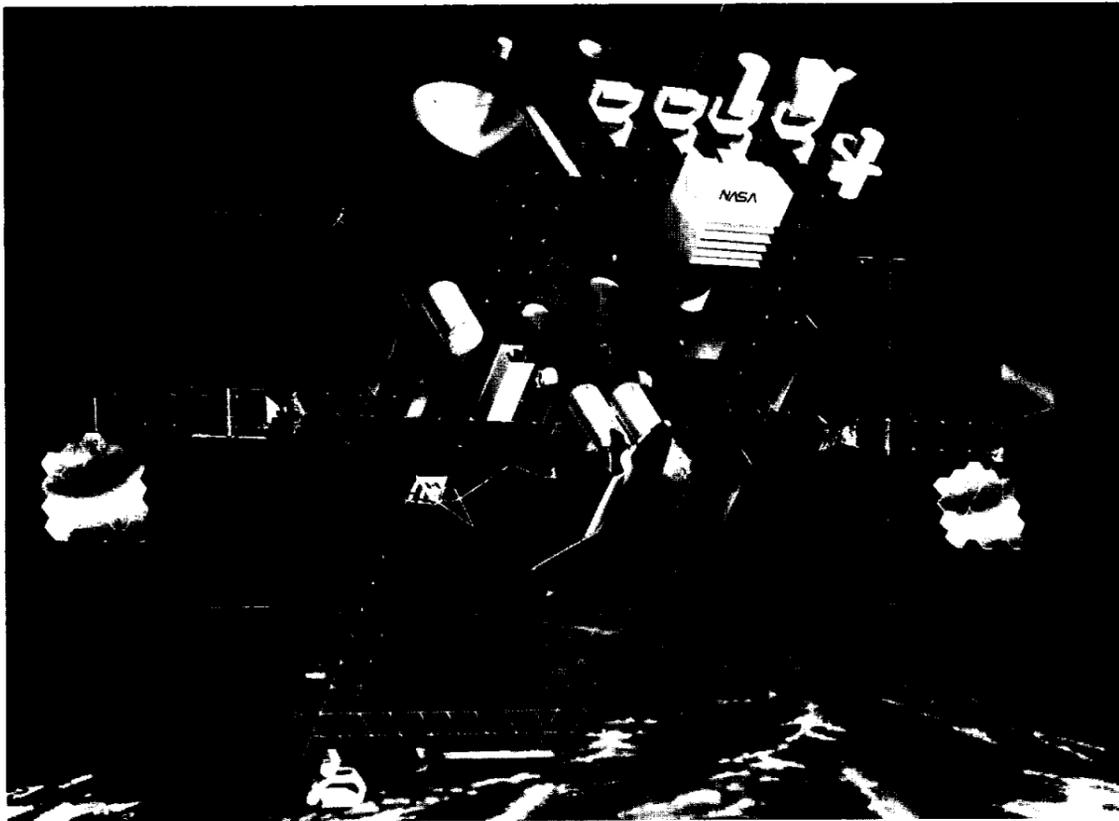
### Earth System Science

NASA, in conjunction with the National Oceanic and Atmospheric Administration and the National Science Foundation, has begun an interdisciplinary effort to study the effects of humans upon the Earth. In supporting the new academic discipline of Earth System Science, NASA Administrator James Fletcher said at a June 26 press conference. "The Earth is a spacecraft in a deadly vacuum, with a life-support system as precious as is an astronaut's backpack in space. We realize that a spacecraft is worth working to save."

### Titan cause cited

The explosion in April of a Titan 34D rocket shortly after launch from Vandenberg Air Force Base most probably was caused by insulation failure near a joint of the solid rocket motor that inspectors did not detect before the flight, the Air Force said last week. The O ring seals in a joint of an SRB that were traced as the cause of the 51-L accident in January were not blamed for the Titan failure an Air Force investigation concluded. The Titan exploded about nine seconds after ignition of the two solid-rocket motors and when the rocket was 800 feet above the launch pad. The explosion caused \$70 million worth of damage to the pad and an adjacent facility, the Air Force said. The cause of the mishap was identified as a failure in the thermal insulation in a segment of one of the two solid rocket motors. The Air Force said the rubber insulation most likely separated from the steel rocket motor case, allowing damage by the propellant combustion products. The failure occurred 5 inches below the joint between motor segments. "It was a failure we would have assigned a very, very low probability of happening," an Air Force spokesman said.

## Space Station management consolidated



No major design changes in the Space Station were made when NASA Administrator James Fletcher announced management changes in the program. This artist's concept shows the hybrid solar array/solar dynamic power system designed for the Space Station.

A number of major organizational and management changes in the Space Station program, effective immediately, were announced June 30 by NASA Administrator Dr. James C. Fletcher.

The changes are designed to strengthen technical and management capabilities in preparation for moving into the development phase of the Space Station program, Fletcher said.

The Administrator also announced the appointment of Lewis Research Center Director Andrew J. Stofan as the new Associate Administrator for Space Station.

Stofan has been director of Lewis since July 1982. Prior to his Lewis assignment, Stofan was Acting Associate Administrator for Space Science and Applications at NASA Headquarters.

The decision to create the new structure comes as the result of recommendations made to Fletcher by a committee headed by former Apollo Program manager Gen. Samuel C. Phillips, who conducted a review of Space Station management as part of a longer-range assessment of NASA's overall capabilities and requirements.

"Basically, we're pulling top level management into Headquarters.

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## Delta failure blamed on damaged wiring

Mechanical damage to wiring caused by vibration during flight was the most probable cause of the Delta 178 rocket accident on May 3, according to Accident Board Chairman Lawrence J. Ross, Director of Space Flight Systems at NASA's Lewis Research Center.

Affirming its belief that the basic design of the Delta rocket is reliable, the board investigating the loss of the Delta reported its findings July 2 to Rear Admiral Richard H. Truly, NASA Associate Administrator for Space Flight.

The Delta rocket, which had a string of 43 successful flights since its previous failure in 1977, was lost May 3 when its main engine and vernier engines shutdown prematurely. Lack of control from the engines led to the breakup of the vehicle in the atmosphere and loss of a GOES weather satellite.

Shutdown of the engines was caused by an electrical short, re-

ducing voltage to solenoids which controlled engine propellant valves. This caused the valves to close, cutting off fuel and oxidizer to the main engine and vernier engines.

The board noted that a design change was made in Delta wiring harnesses several years ago in which previously used Polyvinylchloride (PVC) insulated wiring was replaced with Teflon insulated wiring. Unlike the PVC insulated wiring which was overwrapped for greater abrasion protection, the Teflon wire bundles were overwrapped in only a very limited number of locations.

The finding was that adequate consideration in making the changes was not given to the abrasion resistance of mechanical damping afforded the new wire harnesses. Ross' board recommended redesign of the center section and engine section wiring harnesses to rectify known defi-

ciencies before the next flight.

The board recommendations also included a review of the booster electrical control system for determination of single failure points and possible design changes to provide redundancy as appropriate before the next launch; verification of the quality of all connectors on the next vehicles; and a call for the program to reemphasize that extraordinary care, attention to detail and personal dedication to excellence are vital to the success of systems having the limited fault tolerance of Delta.

The board also made a number of observations of items not felt to be directly connected with the accident which are potential problem areas and recommendations as to what actions might be taken. The observations ranged from high-humidity conditions for vehicles stored at KSC for long periods to instrumentation limitations and the lack of protection of the Rocket-

dyne engine relay box from contamination.

Early suspicions that the relay box had caused the engine shutdown were ruled out through extensive malfunction testing after the box and other electrical components were recovered from the ocean.

On receiving the board's report, Truly noted the following excerpt from the board's letter of transmittal: "In spite of the failure, it should be noted that the Delta remains a remarkably reliable element of our National Space Transportation System. Considering the non-redundant, relatively unforgiving design characteristics of expendable launch vehicles this is indeed a tribute to its highly dedicated government/industry team."

The report will be studied by Truly's office at NASA Headquarters before it is accepted and published in its final form.

## TRW selected to build OMV

NASA ushered in a new chapter in space operations recently when it selected TRW Inc. for negotiations leading to a contract to develop an Orbital Maneuvering Vehicle, the first space robotic vehicle, by 1991.

Sometimes called an "OMV," this unmanned vehicle is a kind of "space tug" which will perform a number of activities—among them, moving satellites and other orbiting objects from place to place hundreds of miles above the Earth. The robot is expected to extend the range of the Space Shuttle by about 1,500 miles, and it will play a major role in the Space Station program.

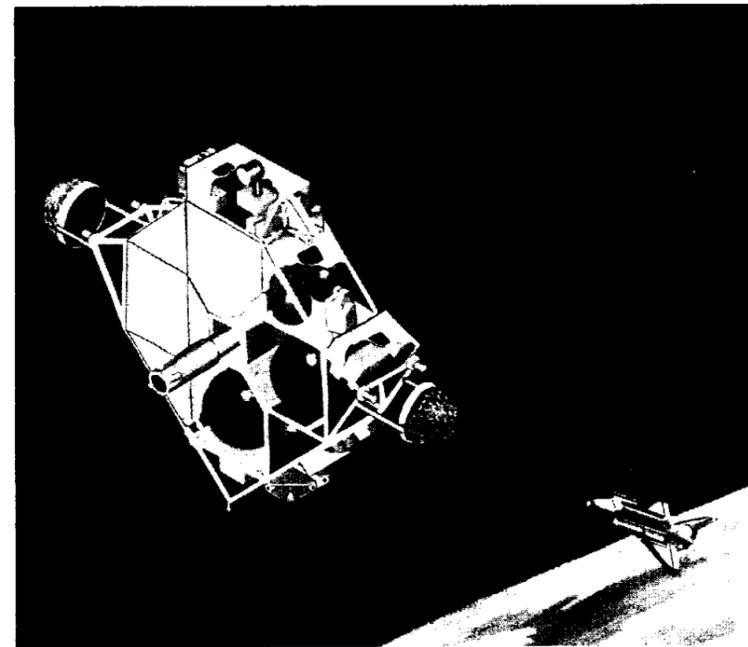
The resulting contract to the Redondo Beach, Calif., aerospace company is expected to be valued at approximately \$205 million.

NASA's Marshall Space Flight Center has managed the earlier vehicle studies and will now oversee its development.

The vehicle will supplement the present Space Transportation System, the heart of which is the Space Shuttle. It will deliver payloads to orbits beyond the practical reach of the Shuttle and later retrieve them. It will also provide a means of reboosting satellites, particularly large observatories, as their orbits gradually decay.

In the early years it is envisioned that the vehicle will be deployed from the Shuttle for each short-duration mission, then it will be returned to Earth for servicing. Later, the vehicle will be based at

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Artist's concept of an Orbital Maneuvering Vehicle, a space-based vehicle which is expected to extend the Shuttle's range 1,500 miles.

## Bulletin Board

### Thorne Scholarship Fund

In the memory of astronaut Stephen D. Thorne, who died May 24 in a biplane accident in north Galveston County, a scholarship fund has been established at a local bank. Persons interested in contributing to the fund should send checks to The Stephen D. Thorne Memorial Scholarship Fund, c/o Security Bank, N.A. Bay Area, P.O. Box 1000, Webster, TX 77598. Please make checks out to the fund.

### JSC Running club

A JSC running club is being organized in early August to promote fitness and to allow runners to pool their resources to further their interest in running. The club will meet at the Gilruth Center monthly to organize fun runs, training runs and car pools to races. Sammy Payne is serving as one of the organizers of the club and said, "We're just getting the club started, and we're open to any suggestions as to how to run the club." Although the club is just beginning, Payne said the JSC EAA has provided them with funds to enter the Houston Corporate Track Association. This organization sponsors eight to 12 functions a year involving a number of corporate running clubs. There are no dues associated with the club. The first meeting of the club is scheduled for the first week in August, but Payne said an exact date has not yet been planned. For more information, call the Gilruth Center at ext. 3594 or Payne at ext. 5949.

### Olympic Festival Tickets

The JSC Employees Activities Association is offering a limited number of reduced-rate tickets to the 1986 U.S. Olympic Festival at the Summit. Tickets for figure skating, rhythmic gymnastics and gymnastics may be obtained at the Bldg. 11 exchange store. Skating tickets are available for \$9.50 for contests at 1 and 7 p.m. July 26 and 27. Rhythmic gymnastics tickets are sold for \$5 for the 7 p.m. July 30 contest. Gymnastics tickets are also being sold for \$9.50 for the 7:30 p.m. shows running July 31 to Aug. 3.

### NARFE August meeting

The regular meeting of the NASA area chapter of the National Association of Retired Federal Employees is scheduled for 1 p.m. Tuesday August 5 at the Harris County Building, Clear Lake, 5001 Rd. 1. For further information, call Dick Jacobs at 532-1075 or Burney Goodwin at 326-2494.

### The Greatest Show on Earth

A limited number of reduced-rate tickets to the Ringling Brothers and Barnum & Baily Circus went on sale June 30 at the Bldg. 11 exchange store. The tickets, available through the JSC Employees Activities Association, are regularly on sale for \$9, but available for \$5. Tickets are for the 11 a.m. shows on July 12 and 19 at the Summit.

## Gilruth Center News

Call x3594 for more information

**Ladies weight training** — This popular course begins July 14 and runs for four weeks. Class meets from 7 to 8 p.m. on Mondays and Wednesdays. Cost is \$20 per person. Limited enrollment exists. First come, first served basis.

**Defensive driving** — Learn how to drive safely and qualify for a 10 percent reduction in your insurance for the next three years. This all-day class meets from 8 a.m. to 5 p.m. on Aug. 16. Class is limited. First come, first served.

**Tennis leagues** — Registration is now being accepted for the summer leagues. Each person must furnish a can of balls. Cost is \$10 per person. Limited enrollment exists; first come, first served. Leagues are as follows: Tuesday mens and womens A, Wednesday mens and womens B and Thursday mens and womens C.

**Tennis reservation rules** — Reservations will only be accepted from those who have paid. Participants must come in and pay 75 cents per person or pay a quarterly or annual fee. Athletic office number is ext. 3594.

**Ballroom dance** — Dance to the music of the Big Band Era. Learn basics of rumba, waltz, cha-cha, foxtrot and swing. Enjoy the revival of smooth tempos with a great beat. Couples only please. This eight-week class begins Thursday Aug. 7. Beginners will dance from 8:15 to 9:30 p.m., intermediates from 8:15 to 9:30 p.m. and advanced from 7 to 8:15 p.m. Cost is \$60 per couple and registration is on a first come, first served basis.

**Dancercise** — Part dance, part exercise, all fun. This class works on toning. It will gradually get you into shape. This six week course begins July 15 and meets on Tuesdays and Thursdays from 5:15 to 6:15. Cost is \$25 per person. Limited enrollment exists.

**Exercise class** — This class meets on Mondays and Wednesdays from 5:15 to 6:15 p.m. Class begins Aug. 18 and lasts 6 weeks. Cost is \$18.

**Computer class** — This course will enable the student to understand the use of computers in our society. It will provide information on how to buy a computer and explain bits through bytes. Syntax, graphics and other topics will be covered. This six-week course starts on July 23 and runs from 7 to 9 p.m. Cost is \$25 per person.

**Jazzercise** — This is a specialized course designed to promote total fitness. Class will consist of a preliminary period of stretching and limbering exercises followed by vigorous aerobic exercises designed to develop cardio-vascular fitness and general muscle tone. Class meets on Mondays and Wednesdays from 4:30 to 5:20 p.m. and costs \$20 per person. This four week class begins Aug. 4.

# Spaceweek activities set for July 16-24

Spaceweek activities this year will be highlighted by a speech by Dr. David Webb of the National Commission on Space whose speech, "Our Future in Space," will comment on the long-range recommendations made by the commission.

Webb's speech is scheduled for July 17 and is part of a nationwide celebration of Spaceweek, which runs July 16-24. Spaceweek is the annual celebration commemorating the voyage of Apollo 11 in July 1969 and the Viking landing on Mars in July 1976.

Among the activities scheduled around Houston and JSC are a space lecture series, a symposium on technology and human values, model rocket demonstrations, space displays, a space-film preview and a space business roundtable.

The Institute of Electrical and Electronic Engineers (IEEE) will host daily lectures on space from July 16-18 and July 21-24 at noon in Bldg. 2 auditorium. Topics for the lecture series are: "Mars: What We Know 10 Years After Viking," July 16; "Apollo Lunar Project Photography," July 17; "Space Station: A New Design Challenge," July 18; "Tropical Environment Trends as Documented from the Space Shuttle," July 19; "Folklore of the Future: Myths and Legends of the Space Age," July 23; and "Space Science," July 24. For further information on the IEEE lecture series, contact Ray Baker, 483-4509.

Peggy Lathlaen, one of the ten finalists in the Teachers in Space Program, will speak at the Space Business Roundtable Event, noon July 16 at the Houston Club. Reservations are required and can be made through Nancy Wood, 474-2258.

A signing party for the *Challenger* memorial painting to benefit the *Challenger* Memorial Scholarship Fund will take place 6 to 10 p.m. July 16 at the South Shore Harbour information center. Limited edition prints of Laurie Whitehead's "and Touched the Face of God" will be available for a \$150 donation. Admission to the event is free, but written invitations are required and are available by calling 482-9400.

The Spaceweek Banquet for American Space Leaders will take place at 6 p.m. July 17 at the Gilruth Center and JSC Director Jesse Moore will introduce Dr. Webb for his speech. Tickets for the banquet are available from the Clear Lake Chamber of Commerce, 488-7676, at \$15 per person and \$25 per couple and should be purchased as soon as possible.

A free preview of the film "For All Mankind" is scheduled for 7:30 p.m. July 18 at the Bldg. 2 auditorium. The film documents the experiences of the 24 lunar astronauts and will be followed by a star-gazing party outside Bldg. 2. Contact Bill Williams, 339-1367, for more information.

"Space and the Human Dilemma" is the title of a symposium sponsored by the University of Houston, Clear Lake, from 8:30 a.m. to 5 p.m. July 19 at the Bldg. 2 press room. The symposium will explore how technology has affected human values and how the space program has affected urbanization in Texas. Additional information is available from Dr. Carol Kaswurm, 488-9320.

Spaceweek activities will also feature two model rocket launch demonstrations. The first, slated at 1:30 p.m. July 19 at the JSC rocket park, will be the site of over 100 model rocket launches. Contact Frank Bittinger at 486-9412. The second is part of the Houston Astros Space Day. Model rockets will be launched inside the Astrodome at 1:30 p.m. July 20. Further information is available by calling 486-9412.

Finally, Spaceweek will feature two additional weeklong activities. Special classes for kids will take place daily at 2 and 3 p.m. July 21-26 at the Burke Baker Planetarium. Classes include sessions on toys in space, astronomy, model rocketry, solar cooking, and astronaut training. Phone 526-4273 for further information. And space displays from Boeing and Lockheed are showing 9 a.m. to 4 p.m. July 16-24 at Bldg. 9A.

For further information on any of the Spaceweek activities, contact Ray Viator at 864-8800.

## Space Station management changes

(Continued from page 1)

much as we did on the Apollo program," Fletcher said.

Fletcher said the new Space Station management structure is consistent with recommendations by the Rogers Commission which investigated the Space Shuttle *Challenger* accident. The commission recommended that NASA reconsider management structures, lines of communication and decision-making processes to assure the flow of important information to proper decision levels.

Fletcher said the program will employ the services of a top-level, non-hardware support contractor. In addition to the systems engineering role, the Program Office will contain a strong operations function to ensure the program adequately deals with the intensive needs of a permanent facility in space.

A Systems Integration Field Office will be established as part of the Program Office organization and will be located in Houston. Fletcher said the new associate administrator will define the longer-term role of the Houston office, the role of the systems engineering and analysis function in Washington, and the schedule of development and transition of functions to Washington.

Project managers located at Goddard Space Flight Center,

Kennedy Space Center, Lewis Research Center, Marshall Space Flight Center, and JSC will report functionally to the associate administrator. They will coordinate with their respective center directors to keep them informed of significant program matters.

In other actions, Fletcher has directed acting Associate Administrator for Space Station John D. Hodge to streamline and clarify NASA's procurement and management approach for the Space Station program and to issue instructions related to work package assignments, procurement of hardware and services, and selection of contractors for the development phase of the program.

In addition, Hodge also has been tasked to develop a program overview document that will spell out the role automation and robotics will play in the Space Station program and to conduct further studies in the areas of international involvement, long-term operations, user accommodations and servicing and issue detailed directions in the near future.

Fletcher has authorized NASA to proceed with the procurement of a Technical and Management Information System (TMIS), a versatile computer-based information network. It will link NASA and contractor facilities together and will provide engineering services, such as computer aided design, as well

as management support on such things as schedules, budgets, manpower and facilities.

Since mid-April, Phillips has been examining the Space Station program from a technical as well as management perspective, as part of a broader look into the way NASA manages its programs, including relationships between the various space centers and NASA headquarters. His report reflects discussions with representatives from all the NASA centers and the contractors involved in the definition and preliminary design of the Space Station, as well as officials from other offices within NASA.

In his January 1984 State of the Union message, President Reagan directed NASA to develop a "permanently manned Space Station within a decade." NASA assigned responsibilities for various elements and systems of the Space Station to five of its space centers, and in April 1984, awarded 21-month long contracts to eight industry teams to conduct definition and preliminary design studies (Phase B). A baseline configuration was selected in May of this year to guide preliminary design activities through the remainder of the Phase B study. Development is scheduled to begin in the spring of 1987. Initial launch of Space Station elements is set for early 1993 with a permanently manned capability to be in place by 1994.

## OMV viewed as key element for Space Station

(Continued from page 1)

the Space Station, which will have servicing capability for one or two vehicles.

The ability of the maneuvering vehicle to support the Space Station, proposed for construction by 1993 and habitability by 1994, is viewed by many in NASA as one of the vehicle's most essential attributes. It will be available to support assembly and buildup of the initial station and afterward will become a vital element in Space Station operations.

The diameter of the disk-shaped robot will be 15 feet—the same

diameter of the cargo bay of the Shuttle—and will be about four feet thick. Weighing about six tons, the maneuvering vehicle will have three different propulsion systems available. Its primary propulsion system will be used to move the vehicle from one orbit to another, while the second and third systems will be used for attitude control and close-in maneuvering.

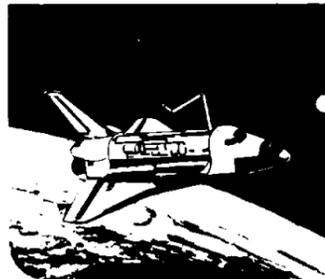
The rendezvous and berthing with the satellite or other spacecraft is accomplished remotely through human flyers at work stations on Earth or aboard the Space Station using television cameras and flood lights onboard the vehicle.

"The maneuvering vehicle pilots will be able to operate under these delicate conditions because of the extensive simulations they've undergone over years of training," said Bill Huber, manager of the Orbital Maneuvering Vehicle Task Team at Marshall. "These simulations have played a key role in the system design and in assuring that this approach works."

"We're elated about this significant step in space robotics. The maneuvering vehicle is going to extend our capabilities in space in ways we probably can't even imagine as yet."

NASA  
Lyndon B. Johnson Space Center

## Space News Roundup



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Editor

Brian Welch

# Teaching machines to see

## Researchers focus on development of synthetic vision

By Barbara Schwartz

It is always quiet on the high frontier, 23,300 miles above the Earth, but in one particular spot in the valuable orbit where communications satellites do their work, a certain stillness signals a malfunction. A \$60 million comsat belonging to a U.S. consortium is dead in space. But help is on the way.

A robot vehicle has been sent up from the U.S. Space Station in low Earth orbit. As the robot moves in on the disabled satellite, it scans the spacecraft, comparing real time holographic imagery with its own database of stored images.

The robot has, in other words, just "seen" the satellite—in much the same way that a human eye can perceive and recognize a familiar object despite differences in orientation or distance.

From its internal database, the robot is able to compare the newly acquired holographic images of the satellite with memory, and after drawing a correlation, is able to positively identify the satellite, verify its position and plot its attitude. The robot then uses its synthetic vision, coupled with a variety of automatic controls, to dock with the satellite and maneuver it back to the Space Station for repairs.

As a result of synthetic vision research being done by Dr. Richard D. Juday, Manager of Optical Information Processing, other members of the Tracking Techniques Branch, Tracking and Communications Division, and other groups around the Center, this hypothetical scenario may be a future reality.

Juday is working on development of optical tracking techniques using Fourier optics, spatial light modulators, optical filters and optical correlators. Ultimately, these devices and techniques will allow a camera system, using the interactions of coherent light beams (and the properties of those beams), modulated by the camera images, to act as a virtual mimic of the human eye and brain. The system would be able to search for and identify various objects in space.

Before that is possible, however, a machine must first be able to cope with variables in sighting and recognition, such as distance and orientation. Jeff Swartz, Tracking Techniques Branch, is working on the design for a programmable retina that might help solve that problem. The retina would be used to adapt images so they could be easily identified regardless of their rotation or magnification.

"We are able to recognize an

object even as distance and orientation change. We're looking at biological models for the programmable retina with respect to pattern recognition," Juday said. He is working with Dr. Marianne Rudisill, Crew Station Design Section, Man-Systems Division, on the flow of information through a biological system and how that can be adapted to synthetic vision.

George Chaikin of Cooper Union in New York is also involved in applying the biological models to synthetic vision research. Juday, Rudisill and Chaikin are among a group of JSC employees, contractors and summer research faculty who are conducting a weekly colloquium on topics relating to synthetic vision and how it relates to NASA's long term requirements. "I think we can come up with an

During the summer, Dr. David Loshin, an optometrist from the University of Houston, is working with Juday to see if some of NASA's research can assist the elderly with various vision problems. "NASA is allied with other groups, such as the National Institute for Aging and the National Institutes for Health to see what kind of technology can be used to help the general populace," Juday said.

One such application is age-related maculopathy, a vision deficiency resulting in a blind spot in the central part of a person's vision. Since there is a peripheral field of vision around the blind spot, researchers believe a programmable retina could help reproduce a complete picture in the surrounding area of vision.

As now envisioned, the equip-

them more visual acuity. The images would look funny, but a person's visual processes are very adaptive in being able to accommodate to strange circumstances," Juday said.

Military applications for optical tracking have already been tested, Juday said. "A number of people are working on that with varied success. There was a robot at Carnegie-Mellon University that found a couple of parallel lines to drive between—the only problem was that the lines were the left and right sides of a tree. Humans are certainly more adaptable than machines, but we would like to put artificial intelligence to work."

Juday has worked at JSC since his graduation from Rice University in 1966. While working here he has earned a masters degree from the University of Houston and in May was awarded a Ph.D. from Texas A&M University.

Juday worked in the Earth observations and remote sensing disciplines before going to work in the Tracking and Communications Division, and said his earlier work in image registration has carried over naturally into synthetic vision research.

Laboratory equipment for the research varies from the highly sophisticated to the highly innovative. Physicist Dr. Stan Monroe, for example, is using a miniature, off-the-shelf Radio Shack television, coupled with lasers and optical filters, to process images. At the same time, Texas Instruments is developing a spatial light modulator and will be delivering an optical correlator later this summer.

Another piece of equipment for the synthetic vision system was entirely designed and built by cooperative education students Tim Fisher and Brian Diauto. It is a two-axis positioner that would in some ways perform the same function as a human being's hand does in the process of pattern recognition. "When somebody hands you an object and says, 'Okay, what is it?' you naturally turn it over in your hands until you recognize it," Juday said. The positioner would rotate an image of a certain object until it matched up with a cataloged image in the computer memory.

The variety of individuals and organizations working on synthetic vision research is far reaching, and the researchers say they believe the development of new technology and equipment is advancing rapidly. With the addition of such equipment as optical correlators and spatial light modulators, they are looking forward to even more research capability in the future.



**Drs. Richard Juday and David Loshin examine a computer-controlled 2-axis positioner, part of the synthetic vision system they and others are working on. The positioner, designed and built by cooperative education students Tim Fisher and Brian Diauto, would aid the system in recognizing objects.**

optimum engineering system. The idea is to simulate, with electronics hardware, and with digital processing and optical coherent light processing, some of the aspects of biological vision systems," Juday said.

Funding for the research comes from the Technology Utilization Office and from the U.S. Army. Both organizations are interested in possible technology spinoff applications.

ment would consist of a small TV camera and a small display in front of the eye. Juday said the display would resemble a picture printed on a rubber sheet with a hole in the middle, then stretched out so that all of the image could be viewed in the peripheral area. "With the stretched out image, it would not look normal, but a person may be able to use it without being unduly disturbed by it. And it would give

# Learning to ride by the seat of one's pants

Come wind or rain—but not both—JSC employees are often fascinated by the sight of Richard Juday pedaling around the Center on his unicycle. Juday has been observed during rainy weather successfully maneuvering his unicycle about the site holding an umbrella along with his working papers.

"You have the wind, an umbrella and a unicycle. You can handle any two of them, but all three is too much," Juday said.

Juday, with the Tracking Techniques Branch, said he learned to ride the unicycle after being issued a challenge by a co-worker.

"I went to Australia to the Division of Computing Research at CSIRO, their federal research organization, for three months in 1980 to work with them on color image processing. While I was there, a co-worker issued me a challenge to learn to ride before I left. I really beat up his unicycle in learning—for which I've been very grateful to him," Juday said.

Juday said learning to ride a unicycle is more difficult than learning to ride a bicycle, but after about 30 days, riding a unicycle becomes second nature



**Dr. Richard Juday demonstrates his control responses on the unicycle.**

"It's a complicated control system all appropriate responses into your brain takes a solid month, where it only takes a day or two to learn to ride a bike. You can use poles or ride alongside a wall to hold yourself up. But once you learn, it is like riding a bike or swimming; you don't forget how to do it," Juday said.

"It's amazing; the complicated patterns your brain is required to learn at a conscious level but then puts into a subconscious level. It's like driving a car. On your way to work you can forget all the other traffic, the eighteen wheelers. And yet when you were learning to drive, that was a really complicated environment that you had to adapt to," he said.

Juday said he fell off the unicycle a lot while learning to ride, but not to worry because "when you lose it, the unicycle squirts out from under you. You really don't fall down. It squirts out, falls to the ground, and you land on your feet."

"I've taken a tumble only twice that I can think of. Once it happened when I was playing tag with my son," Juday said. He added that he gave his son, 17, a unicycle after his son rode his unicycle around the block. They also share a 6-foot "giraffe" unicycle.

Although he said riding the unicycle is an energetic operation, relaxing on the seat and not thrashing around is a key to successful riding. "You spend a long time learning to relax at it. Putting more weight on the seat rather than the pedals is a key to improvement."

# Antique radios to be displayed

By David Luhman

The Shadow and Fibber McGee may have disappeared from the airwaves, but the radios that lived through that historic era are still alive and receiving, thanks in part to some 120 collectors of antique radios in the Houston area.

The collectors are members of the Houston Vintage Radio Association (HVRA), which is part of a nationwide network of radio collection clubs. Five members of the HVRA work at JSC, and they will be showing off some of their antique radios at the Technical Library, Bldg. 45, from July 15 to mid-September.

David Moore, president of HVRA and a Northrop employee working with the Structures and Mechanics Division, has built his radio collection up from a \$1 radio bought from an antique store in the Colorado mountains to 50 radios procured through auctions, flea markets and old attics. "I often buy vintage radios through flea markets and house sales for \$10 or less and

then restore them to the point where they are worth several hundred dollars," Moore said.

Much of the increase in the value of the radios comes from restoring them to working condition. At the monthly meetings of the HVRA, Moore said, collectors sell radios as well as rare tubes and tuning knobs needed by members to get their radios running in mint condition. "Often tubes in a radio are worth as much as the radio itself," Moore said.

But collectors like Moore don't really collect and restore radios for the monetary gain. They seek to preserve the history of wireless communication by restoring and displaying the radios and TV sets used in the early days of transmission.

Lance Borden, who works with Rockwell in the Shuttle Avionics Integration Lab, is a member of both the HVRA and JSC's Amateur Radio Club. He said the vintage radio club meetings are a good way to make connections to buy and repair old radios. Borden has been involved with ham radios since



**Lance Borden tinkers with an old radio in his home workshop.**

1961, and his ham radio ID is WB5REX. His collection of antique radios did not begin until 1980, but it has grown to some 50 units since that time.

Borden and Moore are responsible for the display at the Tech-

nical Library, and Moore may be reached at x2886. The HVRA holds monthly meetings the first Tuesday of each month at the Houston Garden Center in Herman Park. Those interested in joining the club should call Ron Taylor at 726-0783.

## Cookin' in the Cafeteria

### Week of July 14 — 18, 1986

**Monday** — Cream of Potato Soup; Franks & Sauerkraut, Pork Chop, Potato Baked Chicken, Meat Sauce & Spaghetti (Special); French Beans, Buttered Squash, Buttered Beans. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Navy Bean Soup; Beef Stew, Liver & Onions, Shrimp Creole, Smothered Steak w/Dressing (Special); Corn, Rice, Cabbage, Peas.

**Wednesday** — Seafood Gumbo; Roast Beef, Baked Perch, Chicken Pan Pie, Salmon Croquette (Special); Mustard Greens, Italian Green Beans, Sliced Beets.

**Thursday** — Beef & Barley Soup; Beef Tacos, Diced Ham w/Lima Beans, Stuffed Cabbage (Special); Ranch Style Beans, Brussels Sprouts, Cream Style Corn.

**Friday** — Seafood Gumbo; Fried Shrimp, Deviled Crabs, Ham Steak, Salisbury Steak (Special); Buttered Carrots, Green Beans, June Peas.

### Week of July 21 — 25, 1986

**Monday** — Cream of Chicken Soup; Beef Burgundy over Noodles, Fried Chicken, BBQ Sausage Link, Hamburger Steak (Special); Buttered Corn, Carrots, Green Beans. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Beef Noodle Soup; Baked Meatloaf, Liver & Onions, BBQ Spare Ribs, Turkey & Dressing (Special); Spanish Rice, Broccoli, Buttered Squash.

**Wednesday** — Seafood Gumbo; Broiled Fish, Tamales w/Chili, Spanish Macaroni (Special); Ranch Beans, Beets, Parsley Potatoes.

**Thursday** — Navy Bean Soup; Beef Pot Roast, Shrimp Chop Suey, Pork Chops, Chicken Fried Steak (Special); Carrots, Cabbage, Green Beans.

**Friday** — Seafood Gumbo; Broiled Halibut, Fried Shrimp, Baked Ham, Tuna & Noodle Casserole (Special); Corn, Turnip Greens, Stewed Tomatoes.

### AT BUILDING #3

On Wednesday we feature The Reuben: Corned Brisket, Swiss Cheese on a bed of Sauerkraut, Poupon Mustard on Rye and 1/4 Pickle. Delicious!

Monday and Thursday check out our French Dip Sandwich.



### JSC wins trophy

JSC employees walked away with the corporate challenge trophy at the June 28 walk-a-thon sponsored by the Clear Lake Area Jaycees to benefit the Cystic Fibrosis Foundation. The corporate challenge trophy went to the local business with the most employees participating in the event, which raised \$371.

Pictured accepting the trophy from Karen Kyle, chairperson of the Clear Lake Area Jaycees walk-a-thon organizing committee, is Sandy Richardson, President of the JSC Employees Activities Association. Clear Lake Area Jaycees president Marlon Boarnet, left, and James Villareal, Jaycees Community Development Vice President, look on.

The five-mile walk-a-thon began at the University of Houston-Clear Lake, went out to Bay Area Park and then returned to UH-CL.

The Jaycees are a community service and leadership development organization with over 6,100 local chapters across the nation. Regular membership in the Jaycees is open to men and women ages 18 to 35. For more information about the Clear Lake chapter, call Marlon Boarnet or James Villareal at ext. 3921.

## Roundup Swap Shop

All Swap Shop ads must be submitted on a JSC Form 1452. The forms may be obtained from the Forms Office. Deadline for submitting ads is 5 p.m. the first Wednesday after the date of publication. Send ads to Roundup, AP3, or deliver them to the Newsroom, Bldg. 2 Annex, Room 147. No phone in ads will be taken.

### Property & Rentals

Rent: Heritage Park 3-2-2, new paint/ carpet, near school/pool, \$475/mo. + deposit. Sue, x3511 or 486-9469.

Sale: 3-2-2 Friendswood, 4 yr. old home in ex. cond., formal dining, breakfast area, fans, 2 blks from school and pool, \$80,000 OBO. Tanna, x4323.

Rent: Month-to-month 2-2 condo. Fully furnished and equipped in Clear Lake 486-0819.

Sale: New University Green townhouse 3-2-2, mini-blinds, fpl, whirlpool, security, loft, near pool, \$81,000. Dennis, x2868 or 480-5076.

Sale: Mobile home, 1974 Flamingo, 14 x 72, stove, AC, 2-2, \$8,500. Lindemann, 488-3300 or 334-6234.

Lease: Large room in house, pvt. bath, \$200/mo. Mary, x2221.

Lease: Mobile home lot, Dickinson, 50 x 120, good loc., full util. hookups, \$65/mo. 333-3446

Sale/Lease: El Dorado condo, all appl., 2-2, \$450/mo. Rick, x5341.

Lease: Lake Livingston waterfront house, 3-2, fully furnished, pier, ex. fishing, skiing, swimming, weekend & weekly rates. 482-1582.

Lease: 4-2-2 in League City, Country-side, large lot on cul-de-sac, fully fenced, near pool & park, \$550/mo. Tim, x6156 or 486-9318.

Lease: League City 3-2-1, W/D, refrig., fenced, near pool and tennis, \$500/mo. Bob, 282-4381 or 554-2250.

Sale: Dickinson 4-2.5, 3 car garage, approximately 2,450 sq. ft., \$79,900. Bonnie, 337-4557.

Lease: Egret Bay 1-1-2, fpl., W/D, 2 pools, lots of closets, \$335. Atkinson, x3781 or 482-7061.

Lease: Middlebrook 4-2-2, immac. cond., new AC, fenced, drapes, atrium off MB, close to pool/tennis, avail 7-1-86, pets, children, \$675. 488-1956.

Lease: Galv/Jamaica Beach marina house, sleeps 8, city services, central air, from \$170 for 2 days to \$370/wk. (713) 337-3970.

Sale: Countryside League City 3-2 5-2 two story, 1500 sq. ft., \$49,900. Ted, x7484 or 554-7234.

Lease: Beach house, west Galveston Island, 3-2, cent. air, furnished, day/week/month, Ed, x6575.

Lease: 3-2.5-2 townhouse, Friendswood/Forest Bend, new carpet & paint, refrig., fpl., patio/pool, \$500/mo. Mike, x4045 or 474-4482.

Lease: Baywind II, ex. unit, 2-2-2, fpl., patio, wet bar, pools, tennis, W/D, avail. 7-15, \$425/mo. plus dep. Jim, x5933 or 486-4083.

Sale: Friendswood 3-1.5-1, assumable 9.5% VA loan, fenced, trees, near school, \$45,000 total. 482-7546

### Cars & Trucks

'69 VW Campmobile, rebuilt engine, new brakes, tires, shocks, battery, ex. mech. cond., \$2,250. 480-9715

'77 Corvette, black/red interior, T-

top, good cond., \$7,500. Michelle, x5516.

'76 Triumph TR-7, runs well, white w/ blk interior, AM/FM/cass., \$2,500. James, x2481 or 484-5066.

'81 Toyota SR-5 hatchback, AM/FM, AC, 5-sp, new tires, 40k miles, \$3,150. 280-9847.

U.S. gov't vehicle sale, 24 units, inspection period 7-11 July from 8:30 a.m. to 3:30 p.m. bid opening in Fort Worth on July 16, highest bidder will be notified by mail. Floyd, x3670.

'66 Plymouth Fury III, new brakes, carb., tran., fuel pump, tires, muffler, batt., 83,000 mi., \$2,000. Sam, x2958 or 326-1615.

'78 T-bird, wrecked front-end, can be repaired, T-top, new tires, batt., \$500. Margaret, x4414 or (409) 938-8990.

'67 MGB, good cond., running but needs some work, \$1,500 firm. 481-2854.

'77 Cougar SR-7, ex. cond., AM/FM, Michelin radials, 351 eng., one owner, no rust, new carpet, \$1,590. 280-0860.

'75 Granada, good cond., AM/FM, Michelin radials, one owner, no rust, \$890. 280-0860.

'80 AMC Spirit, AC, AM/FM/cass., auto, tinted windows, clean, well kept, great cond., slight left fender bender, \$1,200. Kay, x4036.

MGTD, totally restored, red, leather, 500 mi. since restoring, run ex., extras, \$12,600. Gerlach, x2491 or 482-5825.

'77 Camaro, red, AM/FM stereo, PS, PB, AC, student, must sell, \$1,500 OBO. Cheryl, x5161 or 334-1303.

'81 Toyota shortbed pickup, SR-5 package, ex. cond., \$5,000/neg. 473-7745.

'79 GMC 1/2 ton pickup, ex. cond., two-tone blue, loaded, 482-7546.

'67 Mustang, runs great, good cond., AM/FM/cass., current plates, May inspection sticker, good tires, asking \$2,400. 333-9565 or 538-4327.

'79 Ford Fiesta, 62,500 mi., Sanyo AM/FM/cass., \$1,800. Deena, x3305 or 488-2087.

'81 Ford Escort, PS, PB, AC, good cond., gray & black, new tires and batt., \$2,900 OBO. Donzelle, x3336 or 471-4966.

'55 Chevy Bel Air, ex. cond., see to appreciate, \$6,500. Bonita, 486-1600 or 534-6274.

'86 Mitsubishi pickup, SPX, top of line with camper shell, moving to Europe-must sell, 11,000 miles, \$9,950. 488-0619.

### Cycles

'71 Suzuki T125 motorcycle, needs some work, shop manual. Mark, x5056 or 334-681.

'79 Suzuki 400 dirt bike, good cond., \$450. Michelle, x5516.

'80 Honda CR 80R dirt bike, ex. cond., \$300. 481-2854.

'82 Honda XL 80S, street legal, 900 miles, ex. cond., \$425. Cheryl, x5161 or 334-1303.

'72 Suzuki 185, state inspection, helmet and manual, \$200 w/current plates, \$175 you pay for plates. Jim,

x4179 or 481-3102.

YZ 80 parts, \$45. Jim, x5933 or 486-4083.

### Boats & Planes

18' catamaran AMF Trac sailboat with trailer & extras, like new, \$3,850. 333-3056.

16' Hobie Cat w/ galv. trailer, 1980 edition, fully rigged w/ Harken gear, vest, manuals, like new, \$2,200 OBO. Charlie, x3421 or 480-3260.

Aluminum fishing boat with trailer and electric trolling motor, \$850. Tim, x3411 or 280-1500.

### RVs

Starcraft pop-up camper, AC, sleeps 6, rent at \$180/wk or \$28/day. Glen, x5629 or 480-3015.

'78 Transvan 17' mini Dodge 318, roof air, furnace, kitchen, only 56,000 mi., \$5,000. 337-5018.

### Audiovisual & Computers

Apple II Plus, 64k RAM, 80 col. card, 2 disk drives, BMC monitor, Epson 80-MX IIIIF/T printer, software, 474-4690.

JVC video camera and accessories. Ban, x3472, x3251 or 554-4215.

Video camera, Panasonic PK-959, w/char gen., stereomike, \$550. Sollock, 482-4631.

Olivetti ink jet printer, 110 cps, graphics capability, parallel interface, roll or perf. paper, \$85. 480-9715.

Apple IIe w/ 80 col. card, disk drive, Hayes 300 baud modem, games, \$500. Chris, x2613 or 486-7177.

Professional Mamiya M645 cameras and accessories, like new, will sell all or part, over \$2,500 of equipment, \$1,400. McCreary, x2688 or 488-7636.

### Household

Natural wicker table with round glass top and four high back chairs, paid \$700, asking \$325. Dorothy, x2501 or 482-1505.

Twin headboard & frame mattress, vanity desk chair, chest, shelves, pale green, bamboo style, \$450. 488-4117.

Rosewood china cabinet, glass front & glass shelves, lighted, \$600. Michael, 333-0990 or 339-1452.

Elec. oven, cook top, range hood, double SS sink, 22 white doors with knobs, marble sink/counter, cabinet, all or part, make offer. Victor, x5975.

O'Sullivan entertainment center, ex. cond., \$90; O'Sullivan stereo cabinet, smoked glass door & lid, slide out drawer for cassettes, ex. cond., \$125. Mark, x5056 or 334-6681.

Moving, will trade or sell couch, chair, kitchen table & chairs, twin beds, 2 end-tables, lamps etc. for small car or boat. 333-4751.

Maple bunk beds, ex. cond., \$60. Nancy, x2858 or 482-5607.

Bedroom set, frame, dresser, 2 night-

stands, armoire, ex. cond., \$850; two recliners, \$35 & \$65. Hansen, x2855.

Antique brass Victorian chandeliers, one appraised at \$500, one appraised at \$600, negotiable. David, 480-1867.

Waterbed, includes headboard, mattress cover & sheets, \$75. 480-2367.

Antique dining room set, table, 6 chairs, buffet, needs refinishing, \$350. Hansen, x2855.

Tomlinson tailored chestnut sofa; lamp/coffee table; Drexel pecan tables; Hickory celery arm chair, all in ex. cond., best offer. Connie, x5565 or 333-2271.

Sofa-bed, good cond., needs cleaning, \$85; double bed mattress, box spring & headboard, good cond., \$35. Mike, x4367 or 996-1468.

Antiques: 15 piece ceramic cannister set, from Germany, \$195; oak wall phone in working cond., \$225; 1850 wardrobe/chest combo, crotched mahogany, \$1,200; hump back trunk, \$75; 1910 curio cabinet, \$150. Harry, x4571.

Bedroom lighted desk/hutch, white, \$50; three piece king size mattress set, \$50. Jim, x4179, 481-3102.

Double bed mattress and box springs, ex. cond. Beth, x2076 or 554-2908.

Electric dryer, 4 yrs old, ex. cond., \$75. Ellen Baker, x2321 or 488-7383.

Rattan set, sofa, 2 chairs, 2 tables, lamp, \$250. Ernie, 333-0834 or 474-2153.

Loveseat and matching chair, new, \$275; two filing cabinets on rollers, \$50 for both; antique school desk, \$35; reupholstered foot stool, \$35. 488-5564.

Amana freezer, 22 cu. ft., upright, 1980 model, needs compressor, best offer. Gerlach, x2491 or 482-5825.

Office table, metal legs, \$20; unusual cypress cut quartz wall clock, ex. cond., \$25; two single drawer filing cabinets, metal, \$25 for both. 488-5564.

Pine bed, double, with arched canopy, box springs, mattress & night stand, ex. cond. 326-2461.

### Wanted

Ride from Seamist apts. in Seabrook to NASA, 8 to 4:30 hrs. James, x4241.

Ride from Nassau Bay for myself & my seeing eye dog in exchange for my reserved parking space in Bldg. 8 lot, M-F, 8-4:30. Connie, x6130.

Red child's wagon. Lou, x4009.

Backyard deck, enclosure, etc., reasonable. 486-0568.

Window air conditioners, must be in working order and reasonably priced. Chuck, x4241 or 487-2978.

Left-handed softball glove to buy or borrow. Weide Koop, x2616 or 480-3859.

Small 110 V window air conditioner in good working cond., will pay up to \$75. Harry, x4571.

12" lathe, Atlas, Craftsman or South-bend, also medium to large floor model drill press. 921-7212.

Female roommate to share a three bedroom house with same, League City area, \$300/mo., bills paid, must like animals. 332-0304.

### Pets

One-half miniature schnauzer puppies, free. Dorothy, x1505.

Free retriever puppy, female, 2 mo. old, half golden retriever half black lab. Janet, 480-1225 or 534-7960.

### Miscellaneous

Tennis membership at Bay Area Racquet Club, \$275. Rob, x6134 or 480-2997.

Pickup camper tie downs, \$15; Ford pickup ride rights, \$35; 5-gal. propane tank and regulator, \$25. McCreary, x2688 or 488-7636.

M-14 U.S. rifle, M1A Springfield receiver, like new 308 Cal. (7.62 NATO), \$600. Jack or Linda, 337-1625.

Dynamo foosball table, professional model, ex. cond., \$550 OBO. Tanna, x4323.

Adult trampoline by GAF, 70" x 140" canvas, 106" x 178" frame, \$100 if you move it. Eggleston, 482-4239.

Mossberg 410 gauge combo shotgun, includes stock, long and short barrels, pistol grip and sling, new in box, \$195. Jack or Linda, 337-1675.

Total gym exercise/wt. machine, ex. cond. Tanna, x4323.

Model AR 40 antenna rotator, ex. cond., \$75; lawn spreader, ex. cond., \$20. 921-7212.

Ladies size 7 white roller skates in ex. cond. Beth, x2076 or 554-2908.

25 hp. Gale Bucaneer OB motor, pull start, older but good and tight, \$200 or trade for small motor. 337-5018.

Computer terminal, \$20; trailer hitch, \$20; girls 20" bike, \$15. 488-6521.

0.90 carat oval diamond engagement ring, appraised for \$1,750, will take \$1,000 OBO. Marilyn, 333-5511.

Let's organize a singles tennis league to play mixed doubles for fun & socializing. Stan La Pine, x4730 or write ND32.

Larry Dyke signed and numbered print of the mission, American Masters list for \$400, best offer. Marilyn, 333-5511.

Basketball backboard, fiberglass w/ hoop and roof bracket mount, \$30. Ernie, 333-0834 or 474-2153.

Infant child care in home, all meals and formulas, provide excellent reference. Madeline, x2303.

Canon AE-1 Program SLR camera, 50 mm f1.8 lens, Canon Speedlite flash, case and bag, ex. cond., \$225. Nelda, x5011, 532-1403.

Portable manual typewriter, iron & ironing board, dresser, mattress & box spring, brass bedstead, wooden work table, snorkling eqpt., bulletin bd., wood salad set. Linda, x2411 or 480-3187.

American foosball table, coin operated, good cond., \$250 OBO. 473-7745.

Police scanner, Realistic Pro 2001, 16 channel, programmable, \$150. Glen, x5629 or 480-3015.